

Data sheet

Electric expansion valve

Type AKV 10P, AKV 10PS



AKV 10P and AKV10PS are electric operated expansion valves designed for refrigerating plants.

The AKV 10P and AKV 10PS valves are normally controlled by a controller from Danfoss range of ADAP- KOOL® controllers, that ensures a precise liquid injection into evaporators.

The AKV 10P and AKV 10PS valves are supplied as a part program, as follows:

- Separate valve
- Separate coil with terminal box, DIN plug or cable
- Spare parts in the form upper part, orifice and filter

The orifice assembly is replaceable.

The AKV 10P and AKV 10PS valves cover a wide capacity range.

Features

Precise control of liquid injection

- Optimum utilization of the evaporator
- Increased energy efficiency and COP
- Improved overall system performance
- Enables energy saving minimum stable superheat and adaptive defrost algorithms due to turbulent flow
- Provides excellent distribution and oil return
- Repetitive operation of the valve at all conditions

Balanced cage design

- Higher MOPD and MWP
- Easily fits in various application and operating conditions

Superior valve technology

- Soft pulse operation makes possible to have a low noise valve that guarantees precise flow control and increased energy efficiency of the system

Fully Serviceable valve

- Fast troubleshooting during system diagnostics
- Replaceable filter and orifice assembly
- Special Service coil available for installation and servicing

Fast opening/closing within sec.

- Quick reaction to the operating condition.
- Minimizes the risk of liquid refrigerant flowing into the compressor at shut down and low pressure cut out at start up
- Normally closed Solenoid tight shut-off valve
- Prevents migration of the refrigerant during stand-still
- Reduced complexity by reducing number of components in the system

Supports variety of refrigerants with wider regulation range

- Wide application scope
- #### Compact, lightweight design
- Flexible and easy integration in any system
- #### Wider selection range
- Wider range of coils AC/DC coils with various cable length

Valve construction

- Internal and external corrosion resistant
- #### Protecting the environment and climate
- Manufactured according to ISO/TS16949
 - Second – to – none quality and reliability

Approvals (valves)

Pressure Equipment Directive (PED) 2014/68/EU



RoHS



Technical data

Refrigerant

R744, R22, R23, R134A, R404A, R407A, R407C, R407F, R410A, R422B, R422D, R448A, R449A, R449B, R450A, R452A, R507, R513A.
For other refrigerants, please contact Danfoss.

Direct operated Valve

Valve type	AKV 10P0 to AKV 10P7
Working principle	PWM (Pulse-width modulation)
Recommended period of cycle time	6 Seconds
Regulation range (Capacity range)	10 – 100%
Connection type	Solder
Evaporating temperature	-60 – 60 °C / -76 – 140 °F
Ambient temperature	-50 – 50 °C / -58 – 122 °F
MOPD, AKV 10P0 to AKV 10P6	35 bar / 508 psig
MOPD, AKV 10P7	18 bar / 261 psi
Min. OPD, AKV 10P0 to AKV 10P7	0 bar / 0 psi
Filter, replaceable	Internal 100 µm
Max. working pressure	90 barg / 1305 psig
MAP (Max. Abnormal Pressure)	1305 psig
COT (Continuous Operation Temperature)	140 °F

Servo operated Valve

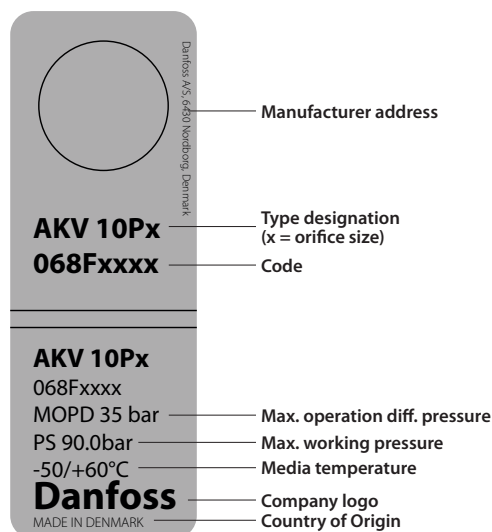
Valve type	AKV 10PS4 to AKV 10PS7
Working principle	PWM (Pulse-width modulation)
Recommended period of cycle time	6 Seconds
Regulation range (Capacity range)	10 – 100%
Connection type	Solder
Evaporating temperature	-60 – 60 °C / -76 – 140 °F
Ambient temperature	-50 – 50 °C / -58 – 122 °F
MOPD	35 bar / 508 psig
Min. OPD, AKV 10PS4 to AKV 10PS7	0.1 bar / 1.45 psi
Filter, replaceable	Internal 53 µm
Max. working pressure	90 barg / 1305 psig
MAP (Max. Abnormal Pressure)	1305 psig
COT (Continuous Operation Temperature)	140 °F
Recommended Danfoss Filter	ELIMINATOR® Hermetic filter drier, type DMSC



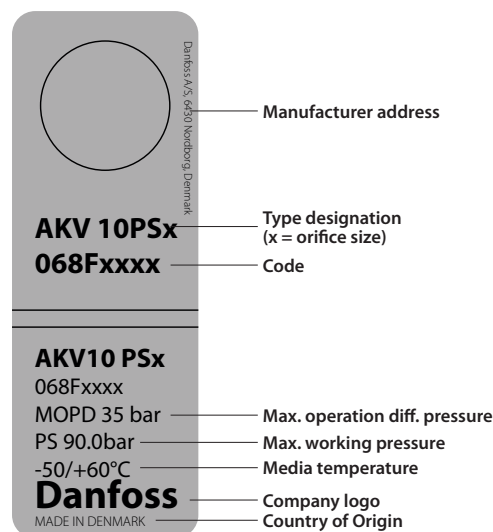
Note: It is recommended to selected Servo operated AKVP10PS valves for those application where higher mopd (with low coil power) and high dampening is required.

Valve identification

**Direct operated valve
AKV 10P0 - AKV 10P7**



**Servo operated valve
AKV 10PS4 - AKV 10PS7**



Capacity and ordering
AKV 10P - Rated capacity

Valve type /orifice no.	R744 ²⁾				R407A ¹⁾		R404A/ R507 ¹⁾		k _v value [m ³ /h]	C _v value [gpm]	Connection size Solder ODF/ODF		Code no. Single pack	Code no. Industrial pack 16 pcs. pr. pack
	Refrig.	Freezing	Refrig.	Freezing	[kW]	[TR]	[kW]	[TR]			[in]	[mm]		
	[kW]	[kW]	[TR]	[TR]										
AKV 10P0	0.44	0.69	0.13	0.20	0.34	0.10	0.21	0.06	0.003	0.0035	3/8 × 1/2	–	068F5210	068F5230
AKV 10P0	0.44	0.69	0.13	0.20	0.34	0.10	0.21	0.06	0.003	0.0035	–	10 × 12	068F5200	068F5220
AKV 10P1	1.17	1.84	0.33	0.53	0.90	0.26	0.8	0.23	0.09	0.104	3/8 × 1/2	–	068F5211	068F5221
AKV 10P1	1.17	1.84	0.33	0.53	0.90	0.26	0.8	0.23	0.09	0.104	–	10 × 12	068F5201	068F5221
AKV 10P2	2.06	3.25	0.59	0.93	1.59	0.45	1.3	0.37	0.016	0.021	3/8 × 1/2	–	068F5212	068F5232
AKV 10P2	2.06	3.25	0.59	0.93	1.59	0.45	1.3	0.37	0.016	0.021	–	10 × 12	068F5202	068F5222
AKV 10P3	3.14	4.97	0.90	1.41	2.43	0.69	2.0	0.57	0.024	0.028	3/8 × 1/2	–	068F5213	068F5233
AKV 10P3	3.14	4.97	0.90	1.41	2.43	0.69	2.0	0.67	0.024	0.028	–	10 × 12	068F5203	068F5223
AKV 10P4	6.10	9.64	1.74	2.75	4.71	1.34	3.1	0.88	0.046	0.053	3/8 × 1/2	–	068F5214	068F5234
AKV 10P4	6.10	9.64	1.74	2.75	4.71	1.34	3.1	0.88	0.046	0.053	–	10 × 12	068F5204	068F5224
AKV 10P5	8.49	13.4	2.42	3.82	6.55	1.87	4.9	1.39	0.064	0.074	3/8 × 1/2	–	068F5215	068F5235
AKV 10P5	8.49	13.4	2.42	3.82	6.55	1.87	4.9	1.39	0.064	0.074	–	10 × 12	068F5205	068F5225
AKV 10P6	15.1	23.9	4.31	6.81	11.7	3.32	7.8	2.22	0.114	0.132	3/8 × 1/2	–	068F5216	068F5236
AKV 10P6	15.1	23.9	4.31	6.81	11.7	3.32	7.8	2.22	0.114	0.132	–	10 × 12	068F5206	068F5226
AKV 10P7	24.6	39.3	7.00	11.1	18.9	5.39	12.5	3.55	0.185	0.214	1/2 × 5/8	–	068F5217	–
AKV 10P7	24.6	39.3	7.00	11.1	18.9	5.39	12.5	3.55	0.185	0.214	–	12 × 16	068F5207	–

¹⁾ Rated capacities are based on:
 Condensing temperature t_c = 38 °C / 100 °F
 Liquid temperature t_l = 37 °C / 98 °F
 Evaporating temperature t_e = 4 °C / 39 °F

²⁾ Rated capacities are based on:
 Condensing temperature t_c = 0 °C / 32 °F
 Evaporating temperature Refrig. t_e = -10 °C / 14 °F
 Evaporating temperature Freezing. t_e = -30 °C / -22 °F
 Subcooling = 1 °C / 1.8 °F

C_v value is calculated from K_v value in above table

AKV 10PS - Rated capacity

Valve type /orifice no.	R744 ²⁾				R407A ¹⁾		R404A/ R507 ¹⁾		k _v value [m ³ /h]	C _v value [gpm]	Connection size Solder ODF/ODF		Code no. Single pack	Code no. Industrial pack 16 pcs. pr. pack
	Refrig.	Freezing	Refrig.	Freezing	[kW]	[TR]	[kW]	[TR]			[in]	[mm]		
	[kW]	[kW]	[TR]	[TR]										
AKV 10PS4	6.10	9.64	1.74	2.75	4.71	1.34	3.1	0.88	0.046	0.053	3/8 × 1/2	–	068F4044	068F5184
AKV 10PS4	6.10	9.64	1.74	2.75	4.71	1.34	3.1	0.88	0.046	0.053	–	10 × 12	068F4034	068F5174
AKV 10PS5	8.49	13.4	2.42	3.82	6.55	1.87	4.9	1.39	0.064	0.074	3/8 × 1/2	–	068F4045	068F5185
AKV 10PS5	8.49	13.4	2.42	3.82	6.55	1.87	4.9	1.39	0.064	0.074	–	10 × 12	068F4035	068F5175
AKV 10PS6	15.1	23.9	4.31	6.81	11.7	3.32	7.8	2.22	0.114	0.132	3/8 × 1/2	–	068F4046	068F5186
AKV 10PS6	15.1	23.9	4.31	6.81	11.7	3.32	7.8	2.22	0.114	0.132	–	10 × 12	068F4036	068F5176
AKV 10PS7	24.6	39.3	7.00	11.1	18.9	5.39	12.5	3.55	0.185	0.214	1/2 × 5/8	–	068F4047	–
AKV 10PS7	24.6	39.3	7.00	11.1	18.9	5.39	12.5	3.55	0.185	0.214	–	10 × 16	068F4037	–

¹⁾ Rated capacities are based on:
 Condensing temperature t_c = 38 °C / 100 °F
 Liquid temperature t_l = 37 °C / 98 °F
 Evaporating temperature t_e = 4 °C / 39 °F

²⁾ Rated capacities are based on:
 Condensing temperature t_c = 0 °C / 32 °F
 Evaporating temperature Refrig. t_e = -10 °C / 14 °F
 Evaporating temperature Freezing. t_e = -30 °C / -22 °F
 Subcooling = 1 °C / 1.8 °F

C_v value is calculated from K_v value in above table

Coolselector®2

Valve sizing using calculation software

It is strongly recommended to use **Coolselector®2** to find the correct valve for our application. The software can be downloaded from the Danfoss website. When using the calculation software it is recommended to choose a valve that is between 50% and 75% loaded at the nominal capacity. In addition, the liquid velocity in the line leading to the valve should not exceed 1 m/s (3ft/s).

You can download it from <http://coolselector.danfoss.com>

Data sheet | Electric expansion valve, type AKV 10P, AKV 10PS

Standard coil for AKV 10P/ AKV 10PS



Solenoid coil with terminal box



Solenoid coil with DIN spade and protection cap



Solenoid coil with cable



Solenoid coil with DIN spade

Approvals (coils)

Low Voltage Directive (LVD) 2014/35/EU



Technical data

Design
In accordance with IEC 60335

Insulation of coil wire
Class H according to IEC 85

Power supply
Alternating current (AC)

Connection
Terminal box, DIN spade or cable

Permissible voltage variation
Alternating current (AC):
50 Hz and 60 Hz: -10% – 15%
50/60 Hz: ± 10%

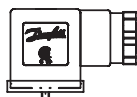
Enclosure, IEC 60529
IP20, IP65 or IP67

Ambient temperature
-40 °C – 50 °C / -40 °F – 122 °F

Ordering coils

Coil type	MOPD (Max. Operation Pressure Differential)						
	Voltage	Frequency	Power consumption	Connection	Multi pack Code no.	Industrial pack Code no.	
	[V AC]	[Hz]	[W]			Code no.	Pcs. per pack
BE230CS	230	50	17	terminal box	018F6732	-	50
BE230CS	230	50	17	DIN plugs	018F6193	-	50
BF230CS	230	50	17	1 m cable	018F6282	018F8232	24
BF230CS	230	50	17	3 m cable	-	018F8290	12
BF230CS	230	50	17	8 m cable	018F4961	018F8291	6
BE240CS	240	60	15	terminal box	018F6713	-	-
BE240CS	220	60	16	terminal box	018F6814	-	-
BE240CS	220	60	12	1 m cable	018F6264	-	-
BG110BS	220	60	12	terminal box	018F6813	-	-

Accessories (coil)



Plug for DIN spade connection

Type	Voltage	Frequency	Quantity	Code no.
	[V]	[Hz]	[Pcs]	Multi pack
DIN plug	Max. 250	50 / 60	100	042N0156

Single pack = 1 product in a box with installation guide
Multi pack = box with x pieces single pack (can be split)
Industrial pack = x pieces in one box (cannot be split)

Coil identification

Example:

Type designation	Code no.	Voltage, frequency, Power consumption	Approvals		Company logo	Country of Origin	Ambient temperature	Production date	Manufacturer address
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Data sheet | Electric expansion valve, type AKV 10P, AKV 10PS

UL coil for
AKV 10P / AKV 10PS



Junction box NEMA 2



Conduit boss NEMA 4

Approvals (coils)



Technical data

Design
In accordance with UL 429

Insulation of coil wire
Class H according to IEC 85

Power supply
Alternating current (AC)

Connection
Junction box or Conduit boss

Permissible voltage variation
Alternating current (AC):
50 Hz and 60 Hz: -10% – 15%
50/60 Hz: ± 10%

Enclosure, IEC 60529
Junction box NEMA 2 ~ IP 12-32
Conduit boss NEMA 4 ~ IP 54

Ambient temperature
-40 °C – 50 °C / -40 °F – 122 °F

Ordering
BJ and BX Coils

Coil type	Wire length		Voltage [V AC]	Frequency [Hz]	Power consumption [W]	Multi pack Code no.
	[in]	[cm]				
<i>Junction box NEMA 2 for AKVP</i>						
BJ024CS	-	-	24	50 / 60	14	018F4100
BJ120CS	-	-	110	50	16	018F4110
BJ120CS	-	-	120	60	15	
BJ240CS	-	-	208 – 240	60	14	018F4120
BJ240CS	-	-	230	50	17	
<i>Conduit boss NEMA 4 for AKVP</i>						
BX024CS	18	46	24	50 / 60	14	018F4102
BX024CS	71	180	24	50 / 60	14	018F4103
BX024CS	98	250	24	50 / 60	14	018F4104
BX120CS	18	46	110	50	16	018F4112
BX120CS	18	46	120	60	15	
BX120CS	36	91	110	50	16	018F4113
BX120CS	36	91	120	60	15	
BX120CS	71	180	110	50	16	018F4114
BX120CS	71	180	120	60	15	
BX120CS	98	250	110	50	16	018F4115
BX120CS	98	250	120	60	15	
BX240CS	18	46	208 – 240	60	14	018F4122
BX240CS	98	250	230	50	17	
BX240CS	18	46	208 – 240	60	14	018F4123
BX240CS	98	250	230	50	17	

Coil Identification

Example:

Company logo

Country of Origin

Type designation

Code no.

Voltage, frequency, Power consumption

Approvals

Ordering spareparts

For Direct operated AKV 10P

AKV 10P0 – AKV 10P3 Orifice kit 1	AKV 10P4 – AKV 10P7 Orifice kit 2	AKV 10P0 – AKV 10P7 Armature kit 3	AKV 10P0 – AKV 10P7 Filter kit 4
Code no. 068F5151	Code no. 068F5152	Code no. 068F5153	Code no. 068F5154
		<p>Retrofit kit for converting AKV 10-1 -- AKV 10-7 and AKVH 10-0-- AKVH 10-6 to AKV 10P0 AKV 10P7</p>	

For servo operated AKV 10PS

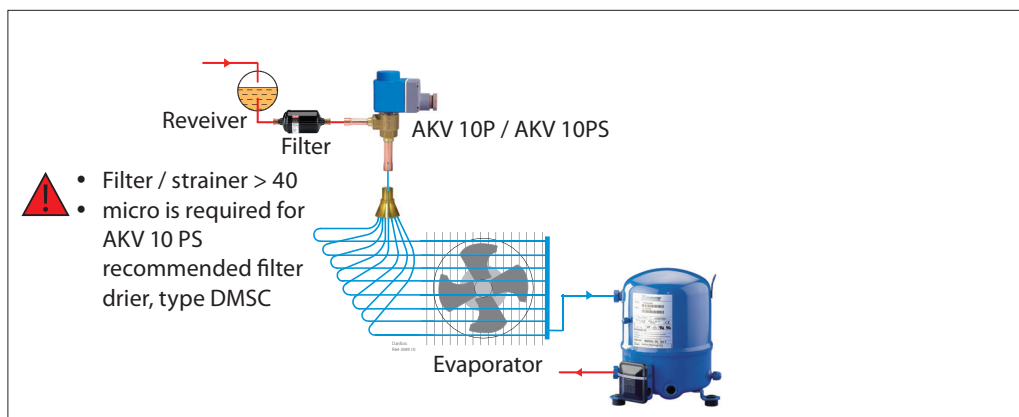
AKV 10PS4 - AKV 10PS7 Orifice kit 5	AKV 10PS4 - AKV 10PS7 Filter Kit 6	AKV 10PS4 - AKV 10PS7 Armature kit 7
Code no. 068F5155	Code no. 068F5156	Code no. 068F5161
		<p>Retrofit kit for converting AKV 10-1 and AKVH 10-0 and AKVH 10-6 to AKV 10PS4 AKV 10PS7</p>

Accessories



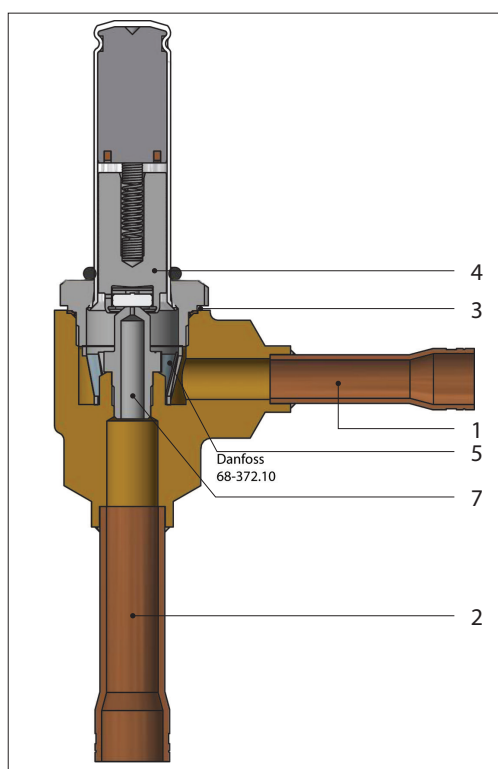
Product	Description	Code no.
Solenoid valve Tester	Permanent magnet for AKV 10P and AKV 10PS (for installation and testing purpose)	018F0091

Typical Application



Design and function

AKV 10P0 – AKV 10P7



Name

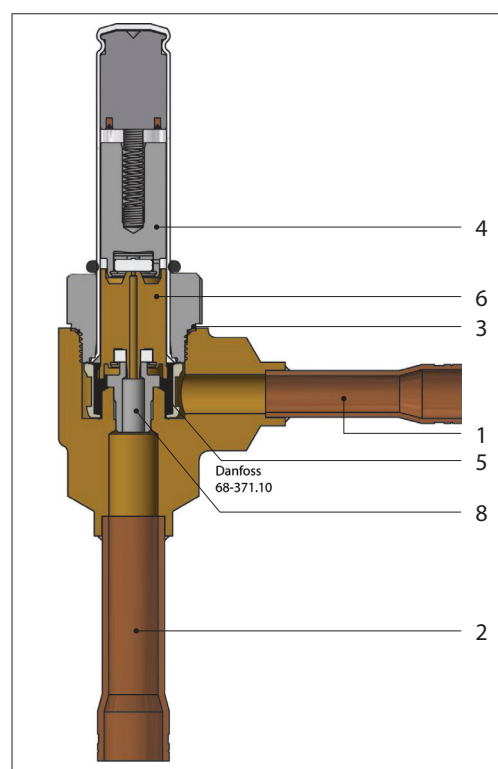
1. Inlet (connection)
2. Outlet (connection)
3. Copper gasket
4. Amature
5. Filter
6. Piston
7. Orifice (AKV 10P)
8. Orifice (AKVP 10PS)

Material

1. Copper
2. Copper
3. Cu/Ti
4. Stainless steel
5. Robusta
6. Brass
7. Stainless steel
8. Stainless steel

The valve capacity is regulated by means of pulse-width modulation. Within a period of six seconds a voltage signal from the controller will be transmitted to and removed from the valve coil. This makes the valve open and close for the flow of refrigerant. The relation between this opening and closing time indicates the actual capacity. If there is an intense need for refrigeration, the valve will remain open for almost all six seconds of the period. If the required amount of refrigeration is modest, the valve will only stay open during a fraction of the period.

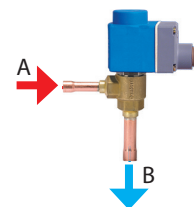
AKV 10PS4 – AKV 10PS7



The amount of refrigeration needed is determined by the controller. When no refrigeration is required, the valve will remain closed and thus function as a solenoid valve. AKV 10P0 - AKV 10P7 is a direct operated valve which can operate at 0 bar/0 psi differential pressure. AKV 10PS4 - AKV 10PS7 is a servo piston operated valve which needs a minimum differential pressure of 0.1 bar / 1.45 psi to open the valve and keep it open.

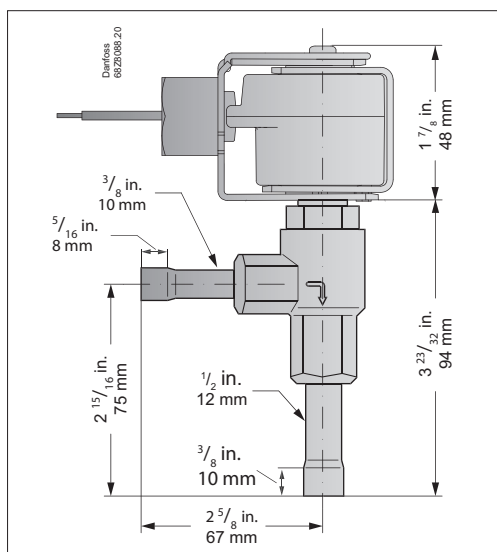
Flow direction

AKV 10P/10PS is designed for single flow direction and following pictures from A to B refers the normal flow.

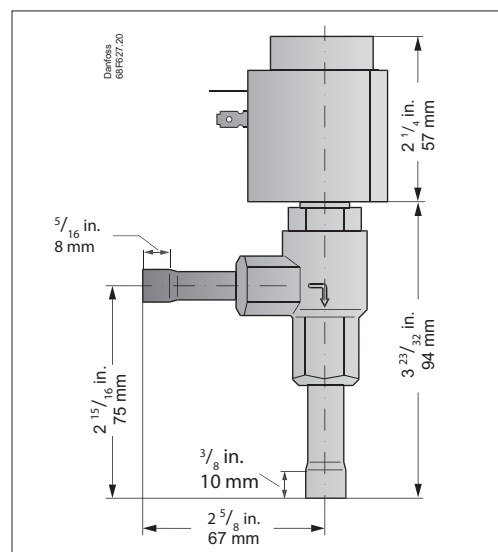


**Dimensions and weight
AKV 10P valve**

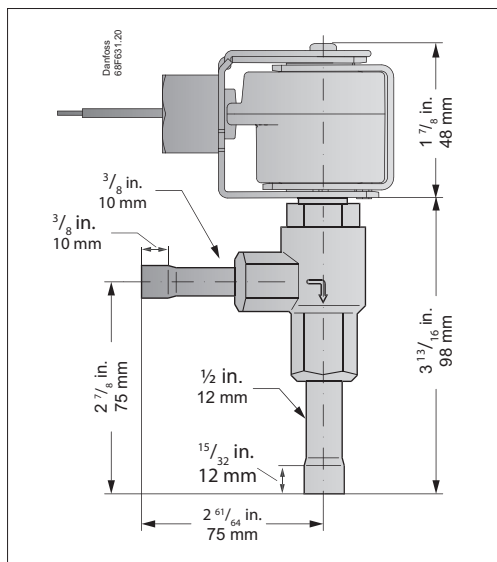
AKV 10P0 - AKV 10P3



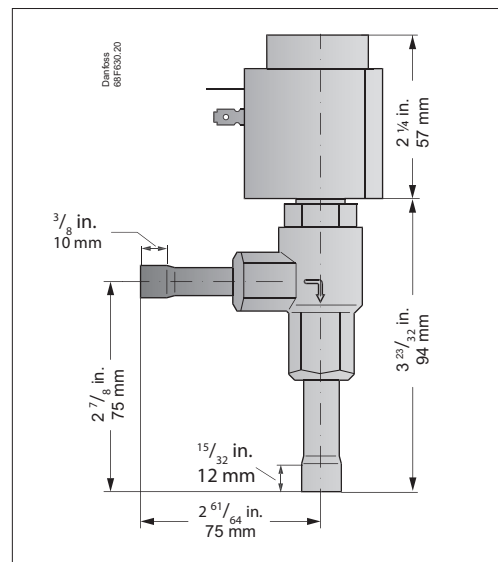
Weight excluding coil: 0.30 kg / 0.66 lbs



AKV 10P7

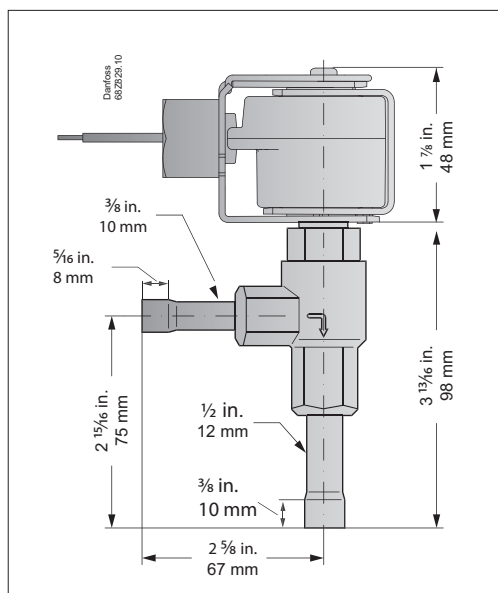


Weight excluding coil: 0.343 Kg / 0.76 lbs

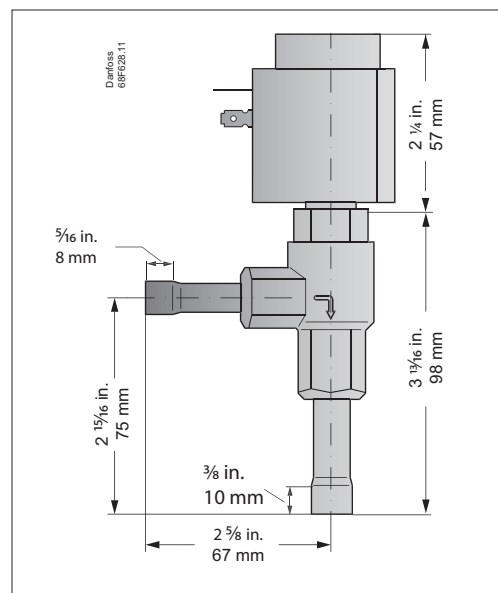


**Dimensions and weight
AKV 10PS valve**

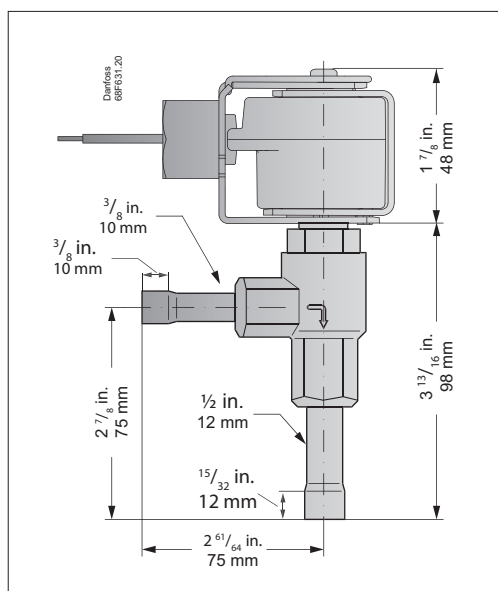
AKV 10PS4 – AKV 10PS6



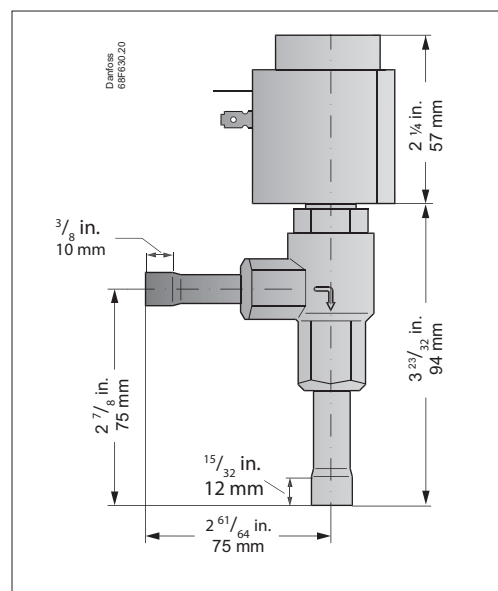
Weight excluding coil: 0.335 Kg / 0.74 lbs



AKV 10PS7

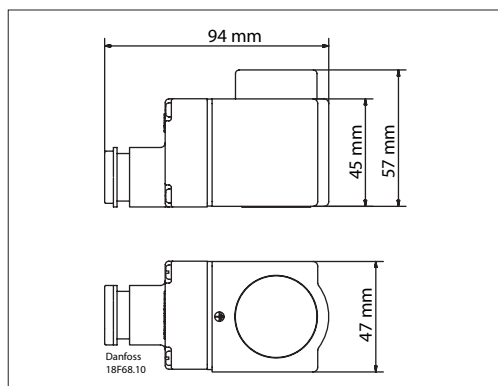


Weight excluding coil: 0.343 Kg / 0.76 lbs

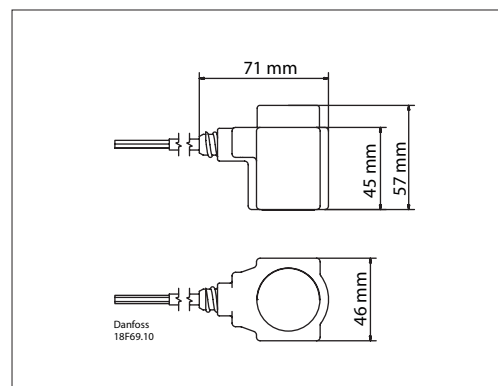


Data sheet | Electric expansion valve, type AKV 10P, AKV 10PS

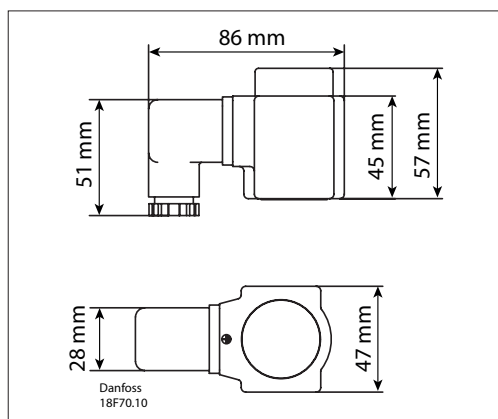
Dimension and weight standard coils



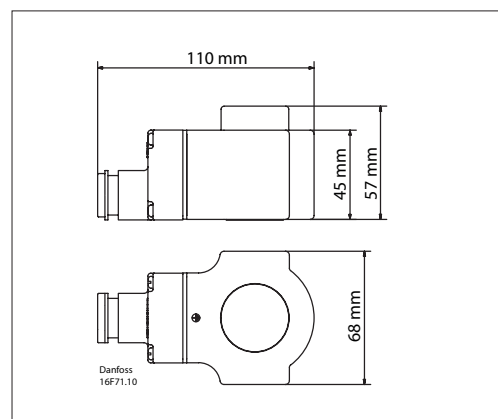
Terminal box 10 W
Weight 0.29 Kg / 0.6 lbs



Cable 10 W
Weight 0.29 Kg / 0.6 lbs

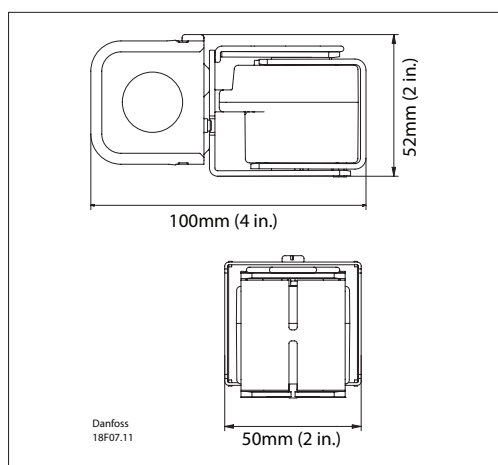


DIN socket 10 W
Weight 0.24 Kg / 0.5 lbs

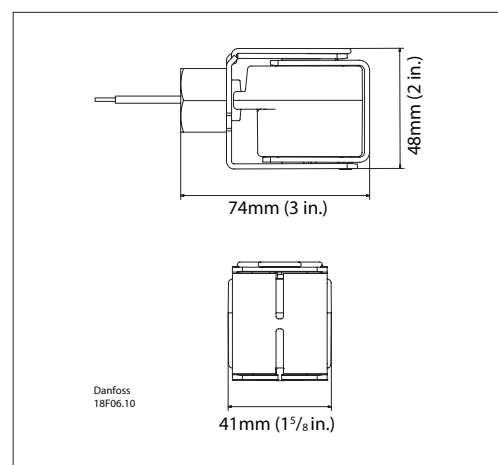


Terminal box 12 - 20 W
Weight 0.55 Kg / 1.2 lbs

Dimensions and weight UL coils



Junction box
Weight 0.860 lbs / 0.39 kg



Conduit boss
Weight 0.717 lbs / 0.33 kg

Troubleshooting

Symptom	Possible Cause	Remedy
Valve does not open	-Lack of proper electrical connection/Power	•Check the connection between valve and a controller
	-Incorrect voltage/frequency	•Check coil specification against measured operating voltage
	-Differential pressure too high/low	•Check differential pressure of valve against technical specification •Replace with suitable valve and or coil
	-Impurities in the valve	•Check dirt inside valve and clean out impurities
	-Burnt out coil	•Never take the coil off the valve if voltage is applied. The coil can burn out •Check the wiring diagram and wiring itself •Check relay contacts, lead connections and fuses
Internal leakage valve does not close or closes partially	-Continuous voltage on coil	•Lift coil and feel if there is any resistance
	-Impurities in the valve	•Check dirt inside valve and clean out impurities
	-Pulsation in discharge line	•Check pressure and flow conditions
	-Differential pressure too high in open position	•Check the supply voltage in the coil •Replace with suitable valve
Insufficient capacity	-Valve too small	•Check refrigeration system capacity and compare with valve capacity •Replace with larger valve if necessary
	-Suction pressure too low -Evaporator superheat too high	•Check superheat performance, the settings SH min and SH max. in the super heat controller •Check valve capacity •Check coil excitation time •Also check section "High Superheat"
	-Valve blocked with foreign material	•Remove and examine the valve
	-Evaporator fully or partly iced up	•De-ice evaporator
High superheat	-Lack of sub-cooling	•Check refrigerant •Also refer to section Insufficient capacity
	-Controller is not setup/tuned properly	•Check the controller superheat settings and sensors connected to it •Tune PID parameters in the controller
Flash gas	-Lack of sub-cooling ahead of valve	•Check refrigerant for flash gas ahead of valve/external subcooler If the valve is placed much higher than condenser outlet •Check pressure difference
	-Oversized valve selected	•Limit max opening degree of the valve setting in controller •Check refrigeration system capacity and compare with valve capacity •Use proper valve size suitable for the system
Overheating coil	-Armature is not moving when coil is energized -(Low voltage, dirt in valve, too high MOPD)	•Check section valve does not open

Appendix: AKV 10P/10PS MOPD with various coils

Type	B	B	B	B	B	B	B
Voltag	230 A	230 A	230 C	230 A	230 C	220 G	240 B
Watt	12	15	17	19	16	16	15
Code no.	018F6176	018F6801	018F6193	018F6905	018F6813	018F6814	018F6188
MOPD at	50 Hz	50 Hz	50 Hz	50 Hz	60 Hz	60 Hz	60 Hz
MOPD at	220 V	220 V	220 V	230 V	110 V	220 V	240 V
AKV 10P0	25	35	35	N/A	35	35	25
AKV 10P1	25	35	35	N/A	35	35	25
AKV 10P2	25	35	35	N/A	35	35	25
AKV 10P3	25	35	35	N/A	35	35	25
AKV 10P4	N/A	25	25	35	18	25	18
AKV 10P5	18	25	25	35	30	35	25
AKV 10P6	N/A	N/A	25	35	18	18	18
AKV 10P7	N/A	N/A	14	18	14	14	N/A
AKV 10PS4	25	25	35	N/A	35	35	30
AKV 10PS5	25	25	35	N/A	35	35	30
AKV 10PS6	25	25	35	N/A	35	35	30
AKV 10PS7	25	25	35	N/A	35	35	30

Type	BX		B			B			BJ	B	B
Voltag	24 C		120 CS			240 CS			120 BS	208 BS	240BS
Watt	14		16			14	14	17	16	16	16
Code no.	018F4103		018F4113			018F4122			018F4130	018F4133	018F4135
MOPD at	60 Hz	50 Hz	50 Hz	60 Hz	60 Hz	60 Hz	50 Hz	60 Hz	60 Hz	60 Hz	
MOPD at	24 V	24 V	110 V	110 V	120 V	208 V	240 V	230 V	120 V	208 V	240 V
AKV 10P0	25	35	35	25	35	18	35	35	35	35	35
AKV 10P1	25	35	35	25	35	18	35	35	35	35	35
AKV 10P2	25	35	35	25	35	18	35	35	35	35	35
AKV 10P3	25	35	35	25	35	18	35	35	35	35	35
AKV 10P4	18	25	30	18	18	14	25	30	30	30	30
AKV 10P5	25	35	35	25	35	18	35	35	35	35	35
AKV 10P6	14	25	25	18	18	14	18	30	25	25	25
AKV 10P7	N/A	18	18	N/A	14	N/A	14	18	14	14	18

AKV 10PS4	25	35	35	30	35	25	35	35	35	35	35
AKV 10PS5	25	35	35	30	35	25	35	35	35	35	35
AKV 10PS6	25	35	35	30	35	25	35	35	35	35	35
AKV 10PS7	25	35	35	30	35	25	35	35	35	35	35

The MOPD values provided in the table above are in bar.

MOPD table is based on:

- Nominal Voltage
- Max media temperature 60 °C
- Max ambient temperature 50 °C

Related products

AK-CC 550 case controller	AK-CC 750 case controller	EKC 315A superheat controller	DMSC Eliminator® hermetic filter drier

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